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## Testing the ecological principles of forest landscape restoration

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### Introduction

In recent decades, human activities have increasingly fragmented native forest habitat in many parts of the world. This is associated with ongoing loss of natural habitat, which is increasingly recognised as the main cause of biodiversity loss (Fahrig, 2003). In several countries, conservation policy now stresses the need to preserve, expand and re-connect habitat fragments at a landscape scale to reverse the continuous loss of species.

In the United Kingdom, woodland conservation is focussing on efforts to reduce and reverse current fragmentation and habitat loss (Peterken, 2002). This has resulted in several policy initiatives focussing on the concept of creating Forest Habitat Networks (FHN) (e.g. Humphrey *et al.*, 2005). These initiatives focus on new woodland development towards linking existing woodland fragments together (Peterken, 2002; Humphrey *et al.*, 2005). This approach is based on the belief that creating new native woodland on suitable locations reduces the negative effects of habitat fragmentation on woodland biodiversity by providing links and 'stepping stones' between isolated populations of woodland species (e.g. Spellerberg and Gaywood, 1993).

Dolman and Fuller (2003) suggest that more studies are necessary on woodland specialists species to provide a firmer basis for current management strategies. To address this knowledge gap, research was undertaken on a specialist woodland invertebrate, the wood cricket (*Nemobius sylvestris*) on the Isle of Wight, UK. Wood cricket is associated with native broadleaved woodlands as its preferred habitat (Richards, 1952) and is of local conservation concern. The main objective was to determine the landscape scale distribution of this species in order to assess whether patch- and landscape-scale variables are related to its occurrence. The results of this study were used to critically examine the principles underpinning woodland restoration and evaluate current forest policy.

### Method

A survey was carried out between mid-July and mid-September 2005 focussing on the northern part of the Isle of Wight where the main fragments of native broadleaved woodlands are located. All mature broadleaf dominated woodland complexes, larger than 5 hectares, were surveyed. Wood cricket was located by recording the sound of stridulating males, which is very distinct and cannot be confused with other species. For the individual woodland fragments, wood cricket presence or absence was recorded. This data were analysed using several patch and landscape variables that were calculated within ArcGIS (version 9.1, Copyright 2005 ESRI, Redlands, California, USA).

## Results

Of the total woodland area (5123 hectares), 45.8 % (2346 ha) was surveyed in 2005, in which 43.4 % (1018 ha) wood cricket was recorded. Significant differences were found between wood cricket presence and woodland age, distance to the nearest neighbouring inhabited woodland and woodland (patch) area (table 1). Wood cricket proved to be more frequently present in old woodlands compared to younger ones, and in woodlands close to sites where wood cricket was also present. Furthermore, large woodlands were more likely to harbour a wood cricket community than smaller ones.

**Table 1.** Results summary for the relation between wood cricket presence and woodland age, distance to the nearest neighbouring inhabited woodland and woodland area.

Chi-Square	N	$\chi^2$	df	P
Age	144	4.553	1	0.033
Mann-Whitney U	N		Z	P
Distance	215		-6.478	0.000
Area	215		-3.175	0.001

## Discussion

Results indicate that wood cricket presence is positively related to woodland age and patch area, and negatively related to distance between individual fragments. This is in line with common assumptions that increasing woodland age is positively related to species diversity; large habitat patches are likely to sustain more species than similar smaller patches and increasing levels of isolation are associated with a decrease in the persistence of species assemblages (e.g. Dolman and Fuller, 2003). These ecologically based assumptions are increasingly incorporated into current forest conservation policy (Defra, 2005). For wood cricket, conservation practice should focus on increasing the size of woodland patches, and reducing the distance between them. However, careful planning and targeting of suitable areas are often lacking in current restoration efforts (Lee and Thompson, 2005). Therefore the focus should be on identifying potential sites for restoration more carefully and focussing on expansion of existing woodlands rather than creating new ones.

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